APRIL/MAY 2025

23PPH32 — CONDENSED MATTER PHYSICS

Time : Three hours Maximum : 75 marks

SECTION A — (10 × 2 = 20 marks)

Answer ALL questions.

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1. State Bragg's law.
2. What is meant by Brillouin zone?
3. Define phase velocity.
4. What is meant by thermal conductivity?
5. Define heat capacity.
6. State Hall effect.
7. Give any two examples for antiferro magnetic materials.
8. State Hund's rule.
9. Define coherence length.
10. What is critical current in superconductor?

SECTION B — (5 × 5 = 25 marks)

Answer ALL questions.

11. (a) What are Miller indices? How the orientation of the crystal plane is specified by Miller indices?

Or

(b) Derive Laue's equations for investigating the diffraction of X-ray in a crystal.

12. (a) Write a short note on Debye's theory of lattice heat capacity.

Or

(b) What is phonon inelastic scattering? Explain.

13. (a) Discuss the band theory of metals and semiconductors.

Or

(b) State and prove Bloch theorem.

14. (a) Give a brief account on Adiabatic demagnetization.

Or

(b) What are Magnons? Discuss about thermal excitation of magnons.

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15. (a) Write a short note on SQUID.

Or

(b) Explain about type I and type II super conductors.

SECTION C — (3 × 10 = 30 marks)

Answer any THREE questions.

16. Determine the atomic packing factor for FCC.

17. Explain in detail about the quartization of lattice vibrations.

18. Derive an expression for Kronig-Penny-Model.

19. Explain in detail about Quantum theorem of ferro-magnetism.

20. What is Josephson effect? Distinguish AC and DC Josephson effect.

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